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***Q&A with NAS President Frank Press***

## R&D Policy After Reagan: First of a Special SGR Series

*With this interview with Frank Press, President of the National Academy of Sciences, SGR inaugurates a year-long, occasional series of interviews with the leaders of American science on Science Policy for the Next Presidency. Press, active in government science-advisory and policy affairs since the mid-1950s, is perhaps the most seasoned figure in this area in Washington today.*

*Chairman of Earth and Planetary Sciences at MIT, 1965-77, Press served as White House Science Adviser throughout the Carter Administration, and has been NAS President since 1981. He was a technical adviser to the nuclear test-ban negotiations, 1959-63, and served as a member of the President's Science Advisory Committee, 1961-64. Press spoke with SGR Editor Greenberg on December 14. The following is from that conversation, transcribed and edited by SGR.*

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*Q. What have been the Reagan Administration's most important contributions in the area of R&D?*

***Press.*** The growth of the basic-science budget has to be attributed to them. In the first year, their basic-science budget wasn't very good. Then, there was recognition of its importance, and it moved ahead very smartly. The reduced application of antitrust to industrial cooperation, in the front end of research, and now in development, was an important step that they took. It made a Sematech concept possible [a federally subsidized industrial consortium for research on semiconductor manufacturing].

Within the Department of Agriculture, there was a movement toward an evaluation of the Agricultural Research Service and quite a bit of progress on peer review and self-analysis. The Biotechnology Sciences Coordinating Committee [a multi-agency body within the White House Science Office] is awkward and complicated, but is important as a transition in this area.

*Q. What are the negatives in this Administration's management of R&D?*

***Press.*** This is not in any order of priorities. In the AIDS area, early recognition of the seriousness and the deployment of resources, both for education and research, was something where we could have done better.

Regarding industrial research, just about every advanced country that we compete with provides some incentives for industrial R&D. We can say that that's not our culture, but we're operating in a world where that is the culture in other countries. We've cut our R&D tax credit. On credits for new investment, it's true that a lot of people exploited that for speculative purposes, but it seems to me that we could have had a tax policy that spurred investment in job-producing, productivity-enhancing areas. Other countries do that. It's not unfair. It's tough to compete when France, Japan, and Germany do that. The R&D is actually the cheap part compared to the rest of what has to be done to be competitive—the investments.

In education, it's not enough to say that education belongs to the states and communities and that the fed-

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***Tottering White House Science Office Subject of Congressional Inquiry—P. 6***

## In Brief

**Scorn and wisecracks have greeted reports that the Office of Management and Budget is considering privatization of NIH's intramural program. Said one Bethesda joker: "I hope they sell us to an elevator company. That's the only way we'll get the elevators working in the Clinical Center."**

*What's clear is that privatization will not happen. NIH's Congressional guardians wouldn't tolerate loss of control over the sole federal agency that the public equates only with goodness. One possibility is that the madcap scheme could give NIH further relief from non-competitive federal pay scales for scientific hotshots. With the top civil service salary set at $73,400, OMB now allows an extra $20,000 for MD researchers.*

**But even with eased rules on consulting and royalty fees, that's still not enough to compete with the $150,000 to $200,000 a year that big academe, biotech, and pharmaceuticals are offering the superstars. The difficulty is that differential pay scales arouse enmity, not least on Capitol Hill, where members receive $89,500.**

*Meanwhile, the federal budget process is bound for another round of confusion. The President's budget for fiscal 1989 (which begins next October 1) would normally be printed and delivered to Capitol Hill early in January, but with OMB still tidying up the accounts from last year's late-running Congress, the process is running at least a month late.*

**With this issue, SGR begins its 18th year of publication. Paid circulation, in 44 countries, totals 1550, for an estimated readership of at least 10,000—which pretty well covers the world science-policy community.**

# . . . An Inventory of Neglect that Predates Reagan Era

*(Continued from page 1)*

eral budget for education is minuscule compared to them. It certainly is minuscule, but it could leverage enormous sums. This is not a criticism of just the Administration, but also of Congress. The Department of Education is so encumbered by strictures and rules and regulations and categorical charges that it's not playing the role that it should: leading innovation, correcting some of the problems. Some of the private foundations are making a bigger impact. Carnegie, for example, with small amounts of money, for such things as national teachers licensing.

This may not sound important, but it is: The reduced level of statistical data collection by the federal government—finding out what's happening in the country, so that wise policies can be made—is a matter of some concern.

## *Failure to Face Acid Rain Problem*

The environmental regulations need to be reexamined and updated. Certainly in the acid rain area, there's been inaction. There's a call for a proof beyond doubt—when just about 90 percent of the scientists feel they know what the sources are for the acidification of lakes. We could have had a stronger policy in that area.

We could have done better in the Carter Administration in many of these areas. The Carter record on acid rain was not good. The response for calls for action always was, "More research is needed." We get the same statement today. The acidification of lakes is a slow process. There was a lot of circumstantial evidence. Carter was an environmentally oriented person, but, still—"more research was needed" before investments were to be made in cleaning up the coal plants.

The Environmental Protection Agency's R&D program is not commensurate with the national need. If you look at the R&D program of the Defense Department or HHS [Department of Health and Human Services], and ask how does EPA compare in its R&D being commensurate with its mission, you're not going to be overly impressed. But that's not just this Administration. It's a history that goes back to the very beginning of the formation of that agency.

***Q.*** *Sematech breaks with the past in US government industrial policy, and it certainly conflicts with the Reagan Administration's devotion to marketplace forces. How do you account for its acceptance?*

***Press.*** One can define a core technology which is absolutely essential to the economic security of a country. There are not many of them. The United States can't give up the production of integrated circuits or the machines that make them, because you're going to find integrated circuits in everything—it's a core technology. If there's a national weakness in a core technology, for one reason or another—antitrust, inadequate research efforts, protectionism of other countries, dumping, poor management—I think one can make the case for a government initiative. Sematech is a government-private cooperation. In our traditional way, it's defense procurement and a slow relaxation of the antitrust laws when there's international competition. I could rationalize that. But a blanket policy of helping American industry across the board by initiatives close to the commercial stage is not within our culture.

***Q.*** *Do you see a rethinking of this tradition in response to economic pressure?*

***Press.*** I think Sematech is a concept that, to a certain extent, goes beyond our traditions. Five, eight years ago, the Sematech people could have been prosecuted. When [as Carter's Science Adviser] I tried to bring the R&D vice presidents of the automotive industry to Washington to discuss a research program in universities that might lead to precommercial research that might be important—this was at a time when Chrysler was failing—many of them said they couldn't be in the same room with their competitors without a dispensation from the Department of Justice. This was on legal advice of their own attorneys.

***Q.*** *Let's talk about the next presidency and the needs and uses of research.*

***Press.*** We're talking within the Academy of preparing for a new Administration a series of white papers or briefings in areas where we've done a lot of studies. These would be intended for the transition team and the new people.

***Q.*** *Would you make these available to the candidates, or would these papers be offered post-election?*

***Press.*** That's what we're talking about right now. Those are the two possibilities. The subject areas are space policy, education of the workforce, AIDS, global

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# White House Science Council: Is Anyone Listening?

Virtually nothing is heard of it publicly, but there is a group of presumed scientific wise men (not a woman on it) officially appended to the White House Office of Science and Technology Policy. Known as the White House Science Council, this unseen 11-member body serves as the adviser to the President's Science Adviser, William R. Graham, with whom it meets every other month for one evening and the following morning. In contemplating science policy for the next presidency, a universally held view of the Council must be considered: Though the membership is of high professional distinction, no one is happy with the placement, role, or influence of the White House Science Council. If it were quietly abolished, few would know or care.

Under Graham's predecessor, George A. Keyworth II, agendas were available to the press and the Council would sometimes meet briefly, though unrevealingly, with reporters before going into closed session. Under Keyworth, the Council's Panel on the Health of US Colleges and Universities issued a public report calling for more money for academic R&D and less red tape. But since the secretive Graham took the post 14 months ago, the Council has dropped from view. Its most recent meeting, held last week, was preceded by an obligatory announcement in the *Federal Register*, with instructions to telephone for the time of the open part of the meeting. Callers were advised that there would be no open session.

SGR hears from sources there that the Council receives briefings from Graham and other federal officials, and then chats back and forth and goes home. One member told SGR that the Council has serious members but no serious role in federal science affairs. To the extent that the Reagan White House seeks and heeds science advice, the main sources are two personal acquaintances of the President, David Packard, of Hewlett-Packard fame and fortune, and Edward Teller, the Reagan Rasputin of R&D. Both are members of the Council.

Among the nostalgists for a non-existent golden age of science and government, the Council is seen as a sickly descendent of the chest-thumping President's Science Advisory Committee (PSAC), an Eisenhower-era creation that continued until Richard Nixon petulantly abolished it when some of its members failed to share his enthusiasm for the supersonic transport.

PSAC prided itself as adviser to the President, rather than adviser to his adviser, and fancied itself as the arms-control counterweight to the Pentagon. Unlike the presentday White House Science Council, it sought and attained visibility with reports on issues ranging from weaponry to science education. And, in contrast to the present Council, PSAC in its later years even had a woman or two and a few social scientists in its ranks.

Following is the membership of the Council:

Harold Agnew, board member, former President, GA Technologies

Edward E. David Jr., former President, Exxon Research and Engineering; White House Science Adviser, 1971-73

Edward Teller, former Director, Lawrence Livermore Laboratory

Solomon Buchsbaum, (Council Chairman) Executive Vice President, AT&T Bell Labs

Allan Bromley, Professor of Physics, Yale

Edward Frieman, Director, Scripps Institution of Oceanography

David Packard, Chairman of Board, Hewlett-Packard

Donald Fredrickson, former Director, NIH; former President, Howard Hughes Medical Institute

John Deutsch, Provost, MIT

Ralph Gomory, Senior Vice President for Science and Technology, IBM

Isadore Singer, Professor of Mathematics, Yale.

***Press*** *(Continued from page 2)*

environmental problems. The candidates have been talking about ozone and carbon dioxide and climatic change. We've had panels on these issues and we're up to speed on them. We might call the panels together again, or call in the chairmen of the panels. Or the officers of the Academy might offer the briefings to all who wanted it, or to the transition team, or to the new Cabinet and sub-Cabinet officers.

***Q. What's your sense of priorities on these issues for the next Administration?***

***Press.*** If the next President and his official family agree that the future economic success of the United States depends more than ever on the development and use of new knowledge, then a great deal follows from that. And, incidentally, the Japanese accept this as their future; they believe they will have economic success on their ability to use new knowledge in developing their economy.

There are the terrifically complicated and difficult problems of education of the workforce, not just the scientists, but the people who take jobs after high school. There are problems here of quantitive skills and literacy. We also have to reverse the trends where some of our brightest people don't choose scientific careers anymore. It's not that other fields shouldn't have bright people in them, but there seems to be a decrease of

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# . . . In Space, "We Can't Fly the Things We've Built"

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people going into technical professional careers. It's worrisome. We're going to try to find the statistics on that. It's all anecdotal, but the university presidents agree when I talk to them that this seems to be the trend.

The global environmental issues. The ozone hole is very worrisome. We have to understand it better and start acting upon it. I'm glad that the United States took the leadership on the ozone treaty, but it was a very modest treaty; we have to do more. If it's the case that CO2 will trigger climatic change—where the best scientific view is that there will be changes in rainfall patterns—now's the time to start thinking of energy alternatives to combustion of fossil fuels. That will require a profound change in our energy economy, as profound as the Industrial Revolution.

## *A New Nuclear Technology*

*Q. In that circumstance, is there an alternative to nuclear as the centerpiece?*

***Press.*** That's the question: What should we be doing now to know what the centerpiece would be. I believe, personally, that maybe now is the time to do the R&D for a whole new generation of nuclear reactors, where on first principles, from the very beginning of the design, safety is built in. So that there's no possibility of an accident—whether human or mechanical error. Maybe that should be a global R&D program.

We certainly have to explore fusion and take the next steps. Conservation is very important. And the sun is a big energy source. The question is not whether it works, but can you make it economical? We should try all of these things.

*Q. All of these are being researched under the present Administration.*

***Press.*** No, they're not. Not the alternative energy sources. The global environmental issues don't exist significantly in any country's research portfolio. Beyond that, among the presidential candidates in both parties, you hear talk about needing to address education and science and so on. But I haven't seen it spelled out on either side in a systematic way in terms of recognizing what the future will be. I haven't seen it spelled out in the way that the Japanese are spelling it out.

*Q. As a very high national priority?*

***Press.*** Yes.

*Q. Erich Bloch [Director of the National Science Foundation] regularly speaks about the urgency of dealing with many of the issues you've listed.*

***Press.*** I'm talking about Cabinet officers and the President and the Presidential candidates. I haven't seen it spelled out in a framework of what has to be done now and down the road, what the goals are, over what time scale, what the federal and state roles are, how one achieves consensus on these issues.

The next Administration has to address space policy. It is extraordinary that with our huge investments in space, and our world leadership position, we are now in what is generally seen to be a disaster mode, having lost a great deal of our capacity.

*Q. We're grounded.*

***Press.*** What better test? We can't fly We can't fly the things we've built, either in defense or in the civil sector. And there are big issues there about the commercialization of space, the priority that space should occupy, the role of man in space. All at a time when the Europeans and the Japanese, and certainly the Soviets, no longer debate this issue. They recognize that they have to play a leading role in space for their own reasons, not only commercial, but intellectual, for exploration. We have to be concerned that there is no consensus in the United States, that our space policy is made year to year, appropriation to appropriation, with no enunciated goals and steps and mileposts or the sorting out of the issues of commercialization versus government, manned versus unmanned. In remote sensing, we invented that field and now you can buy services elsewhere with much higher resolution. And we're still debating about the division of investment between the government and the private sector.

Infectious disease—AIDS—will have to be addressed. The next Administration will be faced with growing costs for treatment of those already infected; huge costs, tens of billions of dollars.

Environmental policy in the biotechnology age. In the '70s, statutes and regulations came down, in terms of the atmosphere and water. Now we're talking about a new age of regulation, of new kinds of drugs, vaccines, the release of genetically engineered organisms. The statutes and regulations are a compromise between safety and not inhibiting new knowledge. That has to be carried out.

*Q. We're in a political situation that decrees less spending. Can there be a burst of research-related spending, and at the cost of what?*

***Press.*** If we want to fund programs, the sources can come in one of two ways, or both: reallocation from one area to another or increased taxation. But the difference between affluence and poverty in the basic-research area is surprisingly modest. You're not talking about a great deal of money. The total NSF budget is about $1.5 billion. So, a 10-percent increase per year is $150 million. The total NIH budget—and that covers more than research—is about $6 billion. So, we're talking about

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# . . . Elevate the Role and Status of Science Adviser

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reallocation at a level of hundreds of millions of dollars per year, which I think is very modest and affordable, if I'm correct about the leverage and the impact in terms of economic develoment of the United States.

*Q. What do you see the next Administration needing in the mechanisms of scientific advice?*

***Press.*** A President whose concerns cover everything that we've been talking about will need on his own staff, at a sufficiently high level, an adviser and a supporter who understands these issues. I think the issues are now so paramount that this person has to be a member of the cabinet without portfolio, without a big department. Or the person should be a full Assistant to the President. Either would work. Not a Deputy Assistant. Not a Director of OSTP [the present White House Office of Science and Technology Policy] and Science Adviser. But a full Assistant to the President.

## *The Need for Access*

A full Assistant to the President has prerogatives that are quite different. He or she can walk into any meeting, can get involved with any issue. A member of the Cabinet without portfolio can do the same. I say without portfolio because I'm not enthusiastic about putting a Department of Science behind him. There's too much uncertainty, too much power for one person when a mistake can damage an important national resource—our scientific strength.

The issues and the problems and the opportunities demand this level of access. The person in this role needs a staff, but not a department; a staff of about 30 or 40, which is about what it was in peak years. I don't mean borrowed personnel, either [a reference to the current OSTP's use of "detailees" from federal agencies and shortterm appointees from non-government organizations]. I think there would be a lot of support in Congress for this, but Congress can't legislate it. The President has to perceive it as a need.

*Q. The legislation that established OSTP [the National Science and Technology Policy, Organization, and Priorities Act of 1976] was ambitious about the structure it was setting up. It simply has been neglected by the White House.*

***Press.*** The Act that established OSTP showed that Congress sort of recognized what I've been saying. But somehow, they missed the point that you can't legislate a person into the White House. There's a very important difference between being in the Executive Office of the President and being on the White House staff. The concept of OSTP has certain advantages in terms of coordinating across government agencies. FCCSET [the Federal Coordinating Council for Science, Engineering, and Technology, a meeting ground for government research agencies] is underused. In areas of developing policy, like biotechnology regulation, coordinating technological relations with other countries, OSTP can serve a very useful function. That's good, but it's not enough.

In terms of the President's almost-daily agenda, I think he needs not a legislated person, but somebody who is involved in policy development within the White House circle.

*Q. Have we ever achieved that? No President, at least since World War II and the Manhattan Project, has regarded science and technology among the highest national priorities.*

***Press.*** We've never achieved it across the board, that is, across all the issues I've mentioned. We've achieved it in certain areas. Certainly [Jerome] Wiesner [Kennedy's Science Adviser] and [George] Kistiakowsky [Eisenhower's] were important in the national security area. And the Wiesner PSAC [President's Science Advisory Committee] tried to do things in education and other areas. But their big success was in counseling in national security and the space programs. What I'm talking about goes way beyond.

*Q. And with Carter, did you achieve it in selected areas?*

***Press.*** Yes, in some areas, but what I'm describing is not a criticism of the past, that others haven't achieved it. The things we're talking about now were not recognized, they were not stated in terms of what are the most important things for the economic success and the quality of life of the American people—their health, jobs, education. I think that across the board, we're going to be involved with new ways of doing things, new knowledge, their application, because that's what other leaders see.

It's interesting that Gorbachev came here with eight members of his Academy of Sciences—economists, legal scholars, scientists. Maybe he sees this.

*Q. Our chief doesn't travel with that kind of retinue.*

***Press.*** Which recent chief traveled with that kind of retinue? I don't think any head of state of any Western country traveled with that kind of intellectual talent. These [the Soviets] were very unusual people. They were very literate, verbal, they made good impressions. They were good communicators as well as strong intellects.

*Q. For the next Administration, do you see any changes in the Academy's role?*

***Press.*** I would see some changes. I'm trying to build

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# House to Hold Oversight Inquiry on Troubled OSTP

The crumbling state of the White House Office of Science and Technology Policy (OSTP) is to be the subject of an unusual Congressional hearing, not yet announced but now almost firmly scheduled for February 17. Witnesses will include some of the leading figures of current and past Presidential science advice, among them several who contend that the Reagan Administration has essentially chucked independent and competent scientific judgment out of the councils of government.

The hearing is being scheduled by the Science, Research, and Technology Subcommittee of the House Science, Space, and Technology Committee. The Subcommittee is chaired by Rep. Doug Walgren (D-Pa.).

Walgren's concern about the condition of Presidential science advice has been inspired by recurring reports that OSTP has declined to near catalepsy during the tenure of William R. Graham, a right-wing nuclear-weapons specialist who took office in October 1986 after some half dozen other candidates rejected the post. Since Graham's arrival, OSTP has undergone almost a complete staff turnover, with many of the newcomers unfamiliar with the Washington scene. Carping about the quality of staff in other organizations is commonplace among bureaucrats, but disdain for the current performance of OSTP has achieved a rare unanimity, from Capitol Hill to the National Academy of Sciences (SGR October 15, 1987).

A concern being voiced by some Congressional staff members and their associates in Executive agencies is that OSTP has been so diminished and demeaned that no one of professional stature will be willing to accept the post in the next Administration, regardless of which candidate makes it to the White House. As extreme and improbable as that may sound, it should be recalled that Ronald Reagan, at the outset of his first Administration, got several turndowns from potential recruits for heading OSTP, and that the post was vacant for the first three months of his presidency. A privately raised concern among those who spurned the job was that Reagan was not likely to take science or science advice seriously.

The prospect of trivial status for OSTP is an affront to the chiefs of the science establishment and their Congressional allies. Both groups earnestly believe that scientific wisdom must be infused into White House thinking and planning. But also present are the power and prestige factors. A Congressional committee is important in proportion to the role of the federal offices in its jurisdiction. And the many science-related lobbies and organizations headquartered in Washington find assurance when one of their own ranks high on the White House staff roster.

## *"New Scientist" Eyes US Market*

The British weekly *New Scientist,* prospering in the UK and looking to expand circulation and advertising, is planning a move into the American market.

The magazine, popular in Britain among scientists and laymen, has no counterpart in the US, where it currently sells about 4500 of its 90,000 circulation. In recent years, *New Scientist* has drawn wads of recruiting advertising, both from British and foreign organizations. One lure of the American market is that the help-wanted ad potential for sci-tech professionals is even greater here. Another is that the slumping dollar trims the costs of American ventures.

Decisions are still to be made on editorial content for the American market and production and distribution methods, but the basic decision to go ahead appears to be settled.

## *Graham the First Witness*

The Walgren Subcommittee hearing will be an oversight proceeding, i.e., an inquiry into what's going on there, with few limitations on the scope of questions. It will be taking place probably within a week or so of the full Committee's annual "posture" hearing on federal R&D affairs, at which the Presidential Science Adviser is the only witness. Posture hearings tend to be brief and gentle; oversight hearings can be rough.

The tentative witness list for the oversight hearing has Graham giving testimony first. Following him is a string of previous Presidential Science Advisers: Frank Press, President of the National Academy of Sciences, who served throughout the Carter Administration; Edward E. David Jr., who served under Nixon; Guy Stever, who held the post under Ford, and Jerome Wiesner, who

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## *Press* *(Continued from page 5)*

our private resources so that there is less the perception that we are a co-opted organization because of where our money comes from. Eighty percent of our money is still federal. Not as a lump sum, but in 200 different projects. If we could have had more private-sector funding with no strings attached, some of the things that we've done that were very important could have been done earlier. Like that AIDS report [*Confronting AIDS: Directions for Public Health, Health Care, and Research,* National Academy Press, 1987], which had tremendous impact on the country. That was all private. We had to go out and raise $600,000. We might have done it earlier if we had financial independence.

# A Harsh Assessment of Reagan and Science Advice

*The severest public criticism to date of Presidential science advice comes from a witness scheduled to testify at the February 17 House hearing on OSTP, Jerome B. Wiesner, President-emeritus of MIT, who served as Kennedy's Science Adviser. Writing last May 24 in the* Washington Post, *Wiesner deplored the failure to reestablish the President's Science Advisory Committee (PSAC), abolished by Nixon in 1973, and was particularly critical of the Reagan Administration's approach to obtaining science advice. Following are excerpts.*

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I am convinced that if there had been adequate Presidential-level overview of technical programs in recent times, the Challenger explosion would not have happened. Although the immediate cause . . . was the explosion of a solid-fueled rocket, the real reason for the failure was that President Reagan did not have his own technical-review team . . . . He received no independent information or advice to help him judge Challenger or any other technical program for which he was responsible, or for that matter, the soundness or need for any of the proposed new programs that flow into the White House continuously, such as, most notably, the Strategic Defense Initiative.

Reagan did not create this situation; he inherited it. It was Nixon who abolished the Science Advisory Committee . . . . Nixon did not want to hear the facts. In a sense he chose to kill the messenger . . . . Ford faced an anti-PSAC bias that lingered on after Nixon and so never was able to create an adequate advisory system. Carter appointed a Special Assistant for science, but didn't reestablish a Presidential Science Advisory Committee with anything like the extensive capabilities of the original committee.

Reagan's operating style dictates altogether different ways of making technical decisions. He uses the buddy system, which in the end, proved disastrous. Reagan has made no effort to get independent advice about technical questions such as the shuttle, or SDI, perhaps because he did not know he needed it. He trusted the advocates who surrounded him during his campaign for the Presidency, and he heeded their advice.

It is true that a number of very good scientists refused Reagan's offer of appointment to the position of Science Adviser when they learned about the limited role they were going to have, and especially that their information and advice would flow to the President mainly through his Chief of Staff; that in fact, they were being asked to be an adviser to a Presidential aide. They might have made a difference. George Keyworth accepted the position despite the limitations and thus served the President and the country poorly.

What can be done to reverse the decline in US technological well-being? . . . . First, the President must resume control of the federal scientific enterprise. He must take back control and oversight of these vast resources from the military-industrial complex. Second, we must simultaneously revitalize the civilian science and technology enterprise, all of it—education, basic research and civilian application of technology . . . .

An essential part of this task is to build the Presidential science-advisory mechanism up in a way that would regain the confidence of the Congress and general public in the government's decision-making process. This will not be easy, given the recent history. But it must be done.

## *Hearing*

*(Continued from page 6)*

served under Kennedy. Not on the list is Reagan's first Science Adviser, George A. Keyworth II, currently thriving in Washington as a consultant.

Following the aforementioned witnesses, according to present plans of the subcommittee, will be James Beggs, the former Administrator of NASA. Beggs first encountered Graham in 1985, when the White House forced Graham upon NASA as Deputy Administrator, despite Beggs' protests that Graham was unqualified for the post. The brief time that they spent together at the space agency was marked by great personal animosity.

Others on the witness list: James Schlesinger, former Secretary of the Department of Energy and the Department of Defense, among numerous other major government posts.

John Slaughter, President of the University of Maryland College Park campus, former Director of the National Science Foundation.

William Golden, an elder statesmen of science, dating back to service with Harry Truman, currently President of the New York Academy of Sciences.

Solomon Buchsbaum, Executive Vice President, Bell Labs, who chairs the White House Science Council.

George Bugliarello, President of Polytechnic Institute, New York.

Fred Leavitt, head of science-government relations for Dow Chemical, a former fellow on the OSTP staff.—DSG

# In Print: Hot Fields of R&D, Education, Space, Etc.

***Research Briefings: 1987*** (68 pp.), sixth annual report on frontier fields of research, prepared for the White House Office of Science and Technology Policy, NSF, and other federal research agencies by the National Academy of Sciences Committee on Science, Engineering, and Public Policy. Topics are selected by OSTP and NSF in consultation with the Academy, which regards the exercise as an opportunity to bring wisdom on scientific priorities to the federal government's high policy councils for R&D. This report covers superconductivity; chemical processing of materials and devices for information storage and handling; order, chaos, and patterns: aspects of nonlinearity; and biological control in managed ecosystems.

**$9.95 in US, Canada, and Mexico; $12.00 overseas. National Academy Press, 2101 Constitution Ave. NW, Washington, DC 20418; tel. 202/334-3318.**

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***Education Information: Changes in Funds and Priorities Have Affected Production and Quality*** (120 pp.), report by the General Accounting Office, requested by the House Subcommittee on Select Education, details the gutting of federal education research programs, noting a sharp dropoff in grants, contracts, surveys, and assessment—while federal education spending totals nearly $20 billion a year. GAO's conclusion: "During the past decade, the production of federally sponsored research, statistical, and evaluative information on education has declined notably."

**No charge. USGAO, PO Box 6015, Gaithersburg, Md. 20877; tel. 202/275-6241.**

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***Economics and Technology in US Space Policy*** (270 pp.), proceedings of a conference co-sponsored in June 1986 by the National Academy of Engineering and Resources for the Future; topics include materials processing, insurance, economics of the space station, and telecommunications.

**$16.50. Resources for the Future, 1616 P St. NW, Washington, DC 20036; tel. 202/328-5006.**

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***The Role of Science and Technology in Economic Competitiveness*** (51 pp.), report from an NSF-supported joint study by the National Governors Association and the Conference Board, concludes, like many of its innumerable predecessors in this genre, that research is an indispensable ingredient of economic competitiveness, more is needed and, to get it, closer relations must be developed between academe, government, and industry.

**No charge. NSF, Forms and Publications Office, Room 232, 1800 G St. NW, Washington, DC 20550; tel. 202/357-7861.**

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***Trends in Public Investment*** (97 pp.), by the Congressional Budget Office, includes only a few pages on R&D, but on the increasingly raised claim of US underinvestment in moneymaking R&D, the CBO supportively notes that "despite a rapid increase in resources for federal research and development in the last decade, resources for net federal investment in those areas of research with the greatest commercial or industrial potential have remained unchanged at about $10 billion a year . . . "

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***Who's Who in Science in Europe: A Biographical Guide in Science, Technology, Agriculture, and Medicine*** (3 volumes, 2880 pp.), first new edition since 1984, published by Longman, Great Britain, contains biographical entries on 21,000 individuals in 30 West and East European countries (USSR not included.)

**$695 per set. Gale Research Co., Book Tower, Detroit, Michigan 48226; tel. 313/961-2242.**

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***Technical Networks Between US and Japanese Industry*** (234 pp.), by Lois Peters, Center for Science and Technology Policy, Rensselaer Polytechnic Institute, documents the little-reported "technical alliance and a growing technology and economic interdependency" between American and Japanese industrial firms.

**$25. Center for Science and Technology Policy, RPI, 725 Park Ave. 4th floor, New York, NY 10021; tel. 212/772-8120.**

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